

# EXCAVATION TOOTH INSTALLATION ASSEMBLY AND METHOD

## BACKGROUND OF THE INVENTION

This invention relates to the securement of excavation teeth upon the shank, more commonly referred to as the adapter, welded to the steel lip of a backhoe bucket and the like.

In accordance with the prior art, excavation teeth are secured to the adapter utilizing an elongated vertical steel pin having a rubbery center section forming a sandwich. The pin is driven through a vertical opening or passageway in a base portion of the tooth and a forward projection of the adaptor.

The rubbery center section is formed by a suitable deformable resilient material such as neoprene so that when the pin is driven into the vertical opening the pin presses against the walls of the adapter after insertion. As the tooth is used often, sometimes in elevated temperature environments, the constant pressure on the pin causes the rubber-like substance to weaken so that the pin then falls out through the bottom of the tooth and adaptor installation assembly resulting in the loss of the tooth. After suitable hydraulic mechanism is repeatedly used to load the bucket with soil or rock, there is a resulting movement of the pin, resulting in wear so that the tooth is no longer serviceable and has to be replaced.

United States Patent No. 3,520,224 illustrates a pin and its use generally in accordance with the prior art as described above. The deformable material is resilient and consists of neoprene of suitable durometer hardness. The prior art is further illustrated by the following U.S. Patents: 4,823,487, 5,724,756, 6,393,738, 6,467,204, and 6,492,469.

## SUMMARY OF THE INVENTION

It has been found that an improved solid pin maybe constructed in such a way as to avoid loosening due to the wear of the rubbery material sandwiched between the steel members in the prior art pins.

Accordingly, it is an important object of the invention to provide an excavation tooth assembly and method that includes the provision of a solid pin for securement of the excavating tooth in a fixed position upon an adapter carried by an excavation bucket and the like.

Another important object of the invention is to provide a tooth assembly method including the use of a solid pin which may be readily installed by insertion through a lower base portion of the teeth and through a vertical opening extending upwardly through the adapter and upper portion of the base of the tooth.

Another important object of this invention is to provide securement for a solid steel pin constructed of an elongated solid section having at the top an upwardly extending threaded shank for carrying a fastener.

Another important object of the invention is to provide a thickened, conical outwardly extending area at an upper surface of the tooth base for receiving a fastener such as a lock nut on the threaded shank within an opening in the thickened area so as

to be protected from damage resulting from engagement of rocks and similar obstacles during excavation.

Another important object of the invention is the provision of an engaging stop surface preferably formed by a lateral extension at a lower end of the pins to limit upward movement of the pins as they are inserted through a bottom of the assembly into the upright passageway extending upwardly through the adapter and thickened area on the upper surfaces of the teeth.

The pin is preferably configured so as to match the aligned upper and lower surfaces of the tooth base and therefore is inclined slightly forwardly to accommodate the inclination of the teeth resulting from their positioning on the adapter. The lateral lower projection is inclined slightly upwardly and the threaded shank is inclined outwardly toward the points of the teeth.

Another object of the invention is to provide a slightly forwardly tapering configuration to the teeth matching the elongated inwardly, tapering surfaces defining the upright passage way.

The objects of the invention are accomplished generally by the combination of implement tooth and implement retaining pin assembly for securing the teeth to the adapter wherein the retaining pin comprises a stop member at one end and a threaded

nipple at the other end for engagement by a lock nut, and wherein opposed surfaces are provided on the teeth to aid in engaging the stop member against going completely through the assembly and against rotation of the pins in the upright passageway.

## BRIEF DESCRIPTION OF THE DRAWINGS

The construction designed to carry out the invention will hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

Figure 1 is a left front perspective view looking downwardly toward an adaptor carried at a leading edge of an excavation bucket illustrating excavation teeth constructed in accordance with the invention attached to the adaptor.

Figure 2 is a longitudinal sectional elevation illustrating the positioning of a solid steel pin within an upright opening in a base of the tooth and in the adapter and including a thickened conical upper portion of the base defining a recess for containing and protecting a threaded fastener.

Figure 3 is a right front perspective view, at an enlarged scale, illustrating an elongated solid steel pin constructed in accordance with the invention having a slight wedge shaped forward taper in cross-section and forwardly inclined upper portion carrying an inclined threaded shank, also forwardly inclined toward the point of the tooth, for receiving a washer and lock nut together with a forwardly extending stop member

integral with the elongated pin at the bottom for limiting the extent to which it may be inserted into the vertical opening from the bottom.

Figure 4 is a perspective view looking toward a front and side at the point of an excavation tooth having a thickened conical section at the upper opening for protecting a pin fastening member from shearing forces during excavation.

Figure 5 is a longitudinal sectional elevation illustrating a vertical opening in the base of the tooth together with a longitudinal alignment member for positioning the tooth upon the adapter.

Figure 6-A illustrates a top plan view of an excavating tooth and assembly apparatus for positioning the teeth upon the leading edge of a bucket.

Figure 6-B is a bottom plan view illustrating the forwardly tapering construction of the pin and vertical opening; and

Figure 7 is a transverse sectional elevation illustrating the positioning of the pin stop member upon the adapter after installation of a tooth.

## DESCRIPTION OF A PREFERRED EMBODIMENT

The drawings illustrate an excavation tooth and fastener assembly and method of excavation installing teeth on an adapter secured to a leading edge of an earth-moving implement. An excavation tooth A has a tooth point on one end and a tooth base at the other end configured for reception upon the adapter. An upper recess B in the tooth base is accessible from an exterior of the tooth base. A lower recess C in the tooth base opposite the upper recess is also accessible from an exterior of the tooth base.

An elongated retaining pin D has a stop member E to limit the extent to which the pin enters a vertical opening in the adapter during installation. An upright threaded shank F carried by one end of the retaining pin is configured for engagement by a compatible fastener G so that, after the retaining pin is inserted through the adapter into the upper and lower recesses in the tooth base and secured by the fastener, a new tooth is fixed upon the adapter.

The method for replacement of worn teeth contemplates limited insertion of a retaining pin upwardly through the tooth and the adapter, and then securing the pin by a fastener located in an upper recess in the tooth.



Preferably, the upper recess is defined by an opening in a thickened outwardly raised generally conical portion in the tooth base to protect the tooth against dislodgment of the fastener as by engagement by rocks or other obstructions during excavation.

The apparatus and method of the invention is useful both for original installations and for the replacement of worn members of the assembly.

A typical excavation tooth A is illustrated in Figures 2 and 4-7 as having point 10 on one end and a base 11 on the other end for reception on the adaptor 12 on the forward lower lip 13 of a bucket such as illustrated at 14. The base 11 of the teeth has a rectangular opening 11a and opposed recesses 11b therein for receiving the adapter 12 as shown in Figure 7. The adapter has a recess as illustrated in Figure 2 at 12 for reception upon the lip 13. An upper, generally cylindrical recess B is formed in a thickened upper wall of the base 11 in the shape of a conical projection 15. The upper recess B is accessible from the exterior of the tooth as is the opposed lower recess C that has forwardly tapering walls 16a and 16b as shown in Figure 6-B.

The elongated upright retaining pin D is best illustrated in Figure 3 as having a stop member E at a lower end to limit the extent to which the pin enters an upright opening or passageway 17 extending through the base and its adapter. Passage of the pin is limited by engagement of the stop member E with the adapter. An upright threaded shank F is carried for engagement by a compatible fastener G on an upper end of the pin.

The stop member F is inclined upward toward the end as illustrated at 18 and has inwardly tapering sides 19 and 20 corresponding to the walls 16a and 16b in the base as shown in Figure 6-B. The tapering sides 19 and 20 extend upwardly defining an elongated intermediate portion 21 of the pin D. The intermediate portion 21 is also illustrated as being inclined forwardly as does the threaded shank F to assume proper alignment within the upright passageway 17. During digging no forces are excerpted upon the lock nut G except to hold the pin in the up position suspended from the bolt.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes in variations may be made in pin and tooth construction without departing from the spirit or scope of the following claims.